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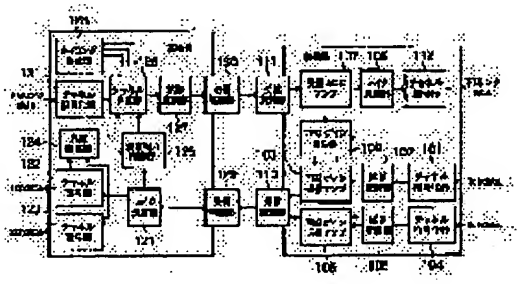
(54) MULTIPLEX COMMUNICATION SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To compatibly manage both the quality required for each logical data and the control of excessive transmission power by controlling the transmission power of a communication device on a logical data transmitting side based on a request quality that is requested to each logical data and a reception quality that is found from actually received logical data.

SOLUTION: Because communication between a base station and a mobile station is communication through a radio channel, it is easily affected by fading, etc. Therefore, a transmission power controlling part 125 on the base station side monitors the state and sets a transmission power control(TPC) bit that instructs the drop of transmission power to 'one' when a receiving state becomes satisfactory and large than a target value. After that, the TPC bit is multiplexed to down link data and is notified to a TPC gain calculating part 109 on the mobile station side. When the part 109 confirms the 'one' of the TPC bit, it sets so as to lower the closed loop gains for 1st ad 2nd series respectively by 1.0 (dB).



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
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CLAIMS

[Claim(s)]
[Claim 1] The 1st communication device which multiplexes the 1st and 2nd logical data which differ in demand quality through two or more physically different communication channels, It is based on the receiving quality searched for from the demand quality required of each logical data, and the logical data received actually. It is the multiplex communication system which has the 2nd communication device which controls the transmitted power of said 1st communication device which is the transmitting side of the logical data concerned. The multiplex communication system characterized by equipping said 2nd communication device with the transmitted power control means which sets up the transmitted power control information which controls the transmitted power of either of said 1st and 2nd logical data, or both sides according to an individual, and transmits this to a 1st communication device side.
[Claim 2] The demand quality as which said transmitted power control means is required of the logical data of 1 in a multiplex communication system according to claim 1, the 1st difference with the receiving quality searched for about the actually received logical data -- with a value the 2nd difference of the demand quality demanded about other logical data of 1, and the receiving quality searched for about the logical data received actually -- the multiplex communication system characterized by what said transmitted power control information is set up for so that a value may approach.
[Claim 3] The multiplex communication system characterized by giving said quality by the frame error rate in a multiplex communication system according to claim 1 or 2.
[Claim 4] The multiplex communication system characterized by giving said quality by receiving signal to noise ratio in a multiplex communication system according to claim 1 or 2.
[Claim 5] It is the multiplex communication system by which said transmitted power control means is characterized for said transmitted power control information by the part or the thing which all are supposed and is transmitted to the 1st communication device of control data in a multiplex communication system according to claim 1 to 4.
[Claim 6] It is the multiplex communication system by which said transmitted power control means is characterized for said transmitted power control information by the part or the thing which all are supposed and is transmitted to the 1st communication device of message data in a multiplex communication system according to claim 1 to 4.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is applied to the migration communication system (personal communication system (PCS), digital cellular system, etc.) which applies a sign division method as multiplex system, concerning a multiplex communication system, and is suitable.
[0002]
[Description of the Prior Art] The following reference is mentioned as reference about the conventional technique.
[0003] Reference 1:"Mobile Station - Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System"IS-95. reference 2:" CDMA-Principles of Spread Spectrum Communication", Andrew J.Viterbi, and Addison Wesley and 1995. reference 3:NTT DoCoMo technical -- the transmitting approach of two or more data systems which can be set to a CDMA communication mode is shown in - journal Vol.4 No.3 [1], for example, reference. A means to thin out the power control data to each mobile station in time sharing on a message channel, and to transmit, and to assign connection control data into the frame of voice data, and to transmit is described by the equipment shown in reference 1. In addition, this means divides a 168 bits [per frame] data area into voice data and connection control data, and is transmitted.
[0004] The distribution approach is defined from a viewpoint of the transmission rate of voice data, and is divided into five kinds on the basis of 9600 bits per second the above of transmission of only voice data, transmission which sets voice data to one half of all data, transmission set to 1/4, transmission set to 1/8, and transmission of only connection control data. Therefore, the number of voice data bits per frame and the number of connection control data bits are set to 168/0, 80/88, 40/128, 16/152, and 0/168. Using the above frame format, according to the amount of information of voice data, the connection control data was adjusted and it has transmitted.
[0005] Moreover, transmitted power control is shown in reference 2. It is shown by the equipment shown in reference 2 that open-loop power control is constituted based on an automatic gain control circuit (the following, AGC circuit). Moreover, power control of a closed loop adjusting power to directions of the power control transmitted from a communication link place, and transmitting it is shown. Especially in reference, it is expressed in order to control an uphill circuit, and corresponding to "0"/"1" of the power control bit transmitted from a base station, carrying out "raising"/"lowering" of the transmitted power is shown.
[0006] Therefore, in the CDMA communication device indicated by the above-mentioned reference 1 and 2, each of voice data and connection control data is logically mapped on the same physics frame, and transmitted power control of open-loop and a closed loop is performed to one physical frame.
[0007] therefore, transmitted power had to be controlled in order to secure the data quality as which severer quality is required, when the quality of the connection control data as the voice data and the 2nd data as the 1st data which is alike, respectively and is demanded differs.
[0008] Moreover, in the case of the above-mentioned reference 1, instead of connection control data, it

has specified transmitting the 1st voice data and the 2nd different voice data as the 2nd data, but it is [that transmission of about 10 [kbps] extent same as a transmission rate is only secured, and].
[0009] Moreover, the technique for transmitting a data sequence to a high speed more, i.e., the technique using an orthogonal code sequence, is shown in reference 3. In addition, the method which transmits a high-speed-data sequence using two or more physical channels divided by the orthogonal code sequence is shown in this reference 3, and since two or more physical channels constituted by the orthogonal code sequence should just transmit the data of the same quality, transmitted power control is carried out only by one line.
[0010]
[Problem(s) to be Solved by the Invention] However, in order to divide into different physical data two or more logical data with which demand quality differs, to fulfill each demand quality and to realize efficient transmission which does not have the delivery in superfluous transmitted power, the means of new transmitted power control according to it is needed.
[0011] A noise is superimposed at the times, such as call data which do not use resending control, the problem of being unable to judge the content of a call in a receiving side arises, at the times, such as connection control data using resending control, it is actually the case where demand quality is not secured, and there is [the overhead by resending becomes superfluous and] a problem which lowering produces in transmission speed.
[0012] Moreover, if superfluous transmitted power is permitted, in a CDMA communication link, it will become the interference to other users' etc. communication link, and will become the cause of the number of cocurrent connection per base station decreasing. The above-mentioned interference occupies most noises for signal transmission, such as other users.
[0013]
[Means for Solving the Problem] In order to solve this technical problem, it sets to this invention. The 1st communication device which multiplexes the 1st and 2nd logical data which differ in demand quality through two or more physically different communication channels, It is based on the receiving quality searched for from the demand quality required of each logical data, and the logical data received actually. It is the multiplex communication system which has the 2nd communication device which controls the transmitted power of the 1st communication device which is the transmitting side of the logical data concerned, and is characterized by having the following means.
[0014] That is, it is characterized by having the transmitted power control means which sets the transmitted power control information which controls the transmitted power of either of the 1st and 2nd logical data, or both sides according to an individual as the 2nd communication device, and transmits this to it at a 1st communication device side.
[0015] Thus, in this invention, since the transmitted power of one side of each logical data which differs in communication link quality, or both sides is controllable, respectively, although the quality required of each logical data is fulfilled, the multiplex communication system which does not need to transmit superfluous transmitted power is realizable.
[0016]
[Embodiment of the Invention] The case where the multiplex communication system concerning this invention is hereafter applied to the migration communication system of a CDMA method is explained.
[0017] (A) The migration communication system explained below a basic system gestalt The 2nd communication device about each of the 1st data received from the 1st communication device, and the 2nd data On the basis of the decibel value of the receiving signal to noise ratio which becomes settled from the transmission quality demanded from the attribute of each data The decibel value of the receiving signal to noise ratio computed from the receiving quality of each actually received data is calculated (hereafter, the thing about the 1st data is referred to as "being SNR the 1st relativity", and the thing about the 2nd data is referred to as "being SNR the 2nd relativity".). these [1st] -- relative SNR and the 2nd -- the value of relative SNR -- absolutely -- difference -- the closed-loop configuration of controlling the transmitted power of the 1st communication device is taken so that a value (the following -- "relative SNR -- difference -- " -- ** -- it says.) may become small.

[0018] Implementation of the efficient transmitted power control means which this system divides into different physical data two or more logical data with which demand quality differs, and fulfills each demand quality by this configuration, and controls transmitted power is in drawing.
[0019] (B) The concrete configuration of the migration communication system applied to this operation gestalt at structure-of-a-system drawing 1 concerning an operation gestalt is shown. In addition, the configuration shown in this drawing expresses only the functional division about this invention, and omits and shows it about other components. Moreover, the configuration shown in this drawing is an expedient configuration of having used for explanation of the functional configuration in this operation gestalt, and the circuitry on actual is not restricted to this.
[0020] In drawing 1 , migration communication system becomes in a mobile station and a base station. Among these, a mobile station is equivalent to the 1st above-mentioned communication device, and a base station is equivalent to the 2nd above-mentioned communication device. Therefore, it goes up, two data sequences are transmitted using a link, and the mobile station which is the 2nd communication device takes the configuration which controls the transmitted power of the mobile station whose base station which was set up between the base stations which are the 1st communication device, and which is the 1st communication device is the 2nd communication device based on the receive state.
[0021] (B-1) **** of a mobile station -- explain the configuration of a mobile station first. The transmitting system in this mobile station is explained to the beginning. This transmitting system consists of the channel encoder 101 corresponding to the 1st data, the diffusion modulation section 102, the adjustable gain transmitting amplifier 103, the channel encoder 104 corresponding to the 2nd data, the diffusion modulation section 105, adjustable gain transmitting amplifier 106, and the transmitting wireless section 110 common to the 1st and 2nd data.
[0022] Here, the channel encoders 101 and 104 are circuits which perform independent coding processing according to the quality required of each 1st and 2nd data, and output the data after coding as channel coded data. In addition, each encoder performs processing of error correcting code-ized processing etc. as coding processing.
[0023] The diffusion modulation sections 102 and 105 are circuits which input channel coded data, carry out the diffusion modulation of this, and are sent out to the adjustable gain transmitting amplifier 103 and 106. The concrete example of a configuration of these diffusion modulation sections 102 and 105 is shown in drawing 2 . The diffusion modulation sections 102 and 105 become each signal system by the orthogonal code generation machines 202 and 205 which generate the orthogonal code of a proper, two steps of exclusive-OR (XOR) computing elements 203 and 204, and 206 and 207.
[0024] Among these, each of the exclusive-OR (XOR) computing elements 203 and 205 formed in the preceding paragraph is a circuit which inputs the orthogonal code which intersects perpendicularly mutually from the orthogonal code generation machines 202 and 205, and each of the exclusive-OR (XOR) computing elements 204 and 207 formed in the latter part is a circuit which inputs a PN code from the PN code generation machine 201.
[0025] After the channel coded data given to the diffusion modulation sections 102 and 105 from the above-mentioned diffusion modulation sections 102 and 105 as an input signal is formed into a rectangular cross signal by each data with the orthogonal code of a proper, respectively, a diffusion modulation is carried out by this configuration by the PN code which is a diffusion sign of a proper, and it is outputted to a mobile station at the latter adjustable gain transmitting amplifier 103 and 106.
[0026] The adjustable gain transmitting amplifier 103 and 106 is the circuit which can change the gain independently based on the gain value specified according to an individual from the transmitted power control (TPC) gain count section 109, respectively. Therefore, from this adjustable gain transmitting amplifier 103 and 106, the diffusion modulation data amplified by each one based on the gain of a proper are outputted to the latter transmitting wireless section 110.
[0027] The transmitting wireless section 110 is a circuit sent out to the base station side which superimposed each diffusion modulation data after magnification, and was connected through the wireless propagation path.
[0028] Next, the receiving system in this mobile station is explained. This receiving system gets down

with the receiving automatic gain control (AGC) amplifier 107, the rake receiver 108, the transmitted power control (TPC) gain count section 109, and the receiving wireless section 111, and consists of channel decoders 112.

[0029] Here, the receiving wireless section 111 is a circuit which detects the input signal received through the wireless propagation path. The detected input signal is given to the latter receiving AGC amplifier 107. The receiving AGC amplifier 107 is a circuit which equalizes the received power of an input signal and is given to the rake receiver 108.

[0030] The rake receiver 108 is a circuit divided into the transmitted power control (TPC) bit sequence which carries out back-diffusion of gas of the input signal after multi-pass composition, gets down from it, and contains the received data and quality correction (MDF) bit of a link. In addition, it gets down, is outputted to the channel decoder 112 about the received data of a link, and is outputted to the transmitted power control (TPC) gain count section 109 about a transmitted power control (TPC) bit sequence.

[0031] The channel decoder 112 is a circuit which performs error correction processing of day interleave processing, Viterbi decoding processing, etc., and carries out termination of the wireless interface.

[0032] The TPC gain count section 109 is a circuit which calculates the suitable TPC gain according to each adjustable gain transmitting amplifier 103 and 106 based on the AGC signal given from the receiving AGC amplifier 107, and the transmitted power control (TPC) bit sequence given from the rake receiver 108.

[0033] In addition, an AGC signal is used for open-loop transmitted power control, and a transmitted power control (TPC) bit sequence is used for transmitted power control of a closed loop.

[0034] Among these, an AGC signal is ****** which compensates the short section fluctuation median which changes at the rate of about 3 [Hz] extent, and is normalized by suitable compression extension processing. These decibel notations are called "opening loop gain" below.

[0035] On the other hand, a transmitted power control (TPC) bit sequence controls the change in a closed loop-gain value by the TPC bit and quality correction (MDF) bit which are contained in this. Among these, it is a bit corresponding to the increase and decrease of directions of a closed loop-gain value, when this bit is "0", the increment of the closed loop-gain value of each 1st and 2nd data in 1.0 [dB] is carried out to a last value, and when this bit is "1", 1.0 [dB] reduction of the TPC bit is carried out to a last value.

[0036] On the other hand, a quality correction (MDF) bit is a bit corresponding to the increase and decrease of directions of only the closed loop-gain value of the 1st data, and is given to the timing of 80 [ms] periods. Here, when an MDF bit is "0", the increment of the closed loop-gain value of the 1st data in 0.1 [dB] is carried out to a last value, and when this bit is "1", 0.1 [dB] reduction is carried out to a last value.

[0037] In addition, this MDF bit value is unrelated to the closed loop-gain value of the 2nd data, and the closed loop-gain value of the 2nd data maintains a last value irrespective of the bit value concerned.

[0038] The count approach of the transmitted power control (TPC) gain of the TPC gain count section 109 in this operation gestalt is shown in the last. This TPC gain count section 109 is calculated from the gain given with the above bit value as TPC gain =(initial gain in maximum data rate)+(opening loop gain)+(closed loop gain)+10*log10 (a transmitting data rate / the maximum data rate).

[0039] Thus, the transmitted power control (TPC) gain calculated the whole data sequence is given to the adjustable gain transmitting amplifier 103 and 106 corresponding to each 1st and 2nd data. In addition, it becomes possible by [as / in this operation gestalt] having introduced the quality correction (MDF) bit to transmit two or more data sequences which have a different data rate and demand quality with the optimal transmitted power.

[0040] (B-2) Explain the configuration of a base station, next the configuration of a base station. The receiving system in this base station is explained to the beginning. This receiving system consists of the receiving wireless section 129, a rake receiver 121, a channel decoder 122 corresponding to the 1st data, and a channel decoder 123 corresponding to the 2nd data.

[0041] Here, the receiving wireless section 129 is a circuit which detects the input signal received

h c g cg b eb cg e e

through the wireless propagation path, and is outputted to the latter rake receiver 121.
[0042] After the rake receiver 121 carries out multi-pass composition of the input signal concerned, by carrying out back-diffusion of gas of this, it separates into the received data corresponding to each of the 1st and 2nd data, and gives the received data corresponding to each data sequence to the channel decoders 122 and 123 corresponding to each. In addition, the rake receiver 121 asks for the input-signal interference ratio (henceforth "Rake SIR") to the 1st data (it is not the 2nd data) from an input signal, and outputs this to the transmitted power control (TPC) section 125. This rake SIR is updated at 1.25 [ms] spacing for example, to 20 [ms] frames.
[0043] The channel decoders 122 and 123 are circuits which perform decode processing of error correction processing etc. and are outputted to a latter-part circuit by using a decode result as decode data to each data sequence separated in the rake receiver 121 of the preceding paragraph. At this time, each of the channel decoders 122 and 123 adds frame inspection sequences, such as cyclic-redundancy-code inspection (henceforth "CRC:Cyclic Redundancy Check"), for every frame unit, and checks existence of a frame error. And when there is need, these channel decoders 122 and 123 are constituted so that resending control etc. may be performed. In addition, the result of CRC obtained at this time is outputted to the quality controller 124 from each of two channel decoders 122 and 123.
[0044] Next, the transmitting system in this base station is explained. This transmitting system gets down with the quality controller 124, the transmitted power control (TPC) section 125, the channel multiplex section 126, the diffusion modulation section 127, the timing generation section 128, the receiving wireless section 129, and the transmitting wireless section 130, and consists of channel encoders 131 of a link channel. In addition, each part of a transmitting system operates based on the timing signal given from the timing generation section 128.
[0045] The quality controller 124 is a circuit which carries out counting of the error frame number per fixed time amount about the 1st and each two data of **, and observes a frame error rate (henceforth "FER") from the frame error judging result given from the channel decoders 122 and 123 corresponding to each data sequence.
[0046] Here, the quality controller 124 asks for the 1st Target SIR and quality correction (MDF) bit about data from observation, and it is constituted so that the target SIR about the 1st data may be outputted to the transmitted power control (TPC) section 125 and a quality correction (MDF) bit may be outputted to the channel multiplex section 126, respectively.
[0047] In addition, it is outputted to 2 [s] at 1 time of a rate at this time SIR, for example, a target, and a quality correction (MDF) bit is outputted to 80 [ms] at 1 time of a rate.
[0048] Here, the quality controller 124 searches for Target SIR as follows. For example, when the frame error is contained in the 1st data received between 2 [s], the quality controller 124 adds the constant value in the target SIR currently held till then and the frame error is not contained in the 1st data similarly received between 2 [s], it asks by subtracting a certain constant value from the target SIR currently held by then.
[0049] On the other hand, the quality controller 124 asks for the MDF bit which is another output as follows. Here, the principle of a way to search for is explained using drawing 3 .
[0050] As a premise, the quality controller 124 holds data, i.e., the data which can specify the SNR pair FER characteristic curve about each 1st and 2nd data, as shown in drawing 3 currently held inside, or approximation data with the gestalt of a table means, and calculates data required of the step of the following three-stage by using the data concerned.
[0051] First, the quality controller 124 acquires FER (henceforth "Demand FER") which becomes settled from the attribute value of each data, and a SNR (henceforth "Demand SNR") value required to realize this as the 1st step. Next, the quality controller 124 asks for Observation FER as the 2nd step by calculating the moving average of the time amount section according to Demand FER from the frame error judging result about each data sequence given from the channel decoders 122 and 123. The quality controller 124 asks the last for the observation SNR corresponding to Observation FER as the 3rd step.
[0052] what lengthened Demand SNR from the above-mentioned observation SNR in this operation gestalt -- relativity -- relativity [as opposed to / call it SNR and / the 1st data and each 2nd data] -- SNR

-- the 1st -- relative SNR -- and it is called SNR the 2nd relativity.
[0053] thus, the relativity about each data sequence -- when SNR could be found, the quality controller 124 was based on SNR the 2nd relativity -- an MDF bit is generated from the relation of SNR the 1st relativity. what lengthened SNR the 2nd relativity from SNR the 1st relativity as predetermined relation here -- relativity -- SNR -- a definition is given as difference.
[0054] here -- the quality controller 124 -- relativity -- SNR -- "1" which orders a mobile station to perform "reduction" of transmitted power as an MDF bit when difference is zero or more -- outputting -- relativity -- SNR -- when difference is negative, "0" which orders "an increment" in transmitted power is outputted to a mobile station.
[0055] The transmitted power control (TPC) section 125 is a circuit which compares the target SIR given from the quality controller 124 with the rake SIR to the 1st data given from the rake receiver 121, and calculates a transmitted power control (TPC) bit.
[0056] Here, the TPC section 125 outputs "0" which orders "an increment" in transmitted power to a mobile station as a TPC bit, when Rake SIR is less than Target SIR, and when Rake SIR is beyond the target SIR, it outputs "1" which orders "reduction" of transmitted power.
[0057] The channel encoder 131 is a circuit which gets down, performs coding processing of link data, and is outputted to the channel multiplex section 126 by making the data after coding into channel coded data. Also in this encoder 131, processing of error correcting code-ized processing etc. is performed as coding processing.
[0058] The channel multiplex section 126 is a circuit which multiplexes the quality correction (MDF) bit given from the above-mentioned quality controller 124, and the transmitted power control (TPC) bit given from the transmitted power control section 125 to channel coded data, and outputs it to a latter-part circuit. In addition, a TPC bit is assigned 1.25 [ms] periods, and an MDF bit is replaced with and transmitted to a TPC bit here 80 [ms] periods begun from even seconds of time of day. The transmit timing of this TPC bit and an MDF bit is shown in drawing 4 .
[0059] The diffusion modulation section 127 carries out the diffusion modulation of the output data of the channel multiplex section 126, it is the circuit outputted to the transmitting wireless section 130, and the data after a modulation are sent out to the mobile station side which counters from the transmitting wireless section 130 through a wireless propagation path.
[0060] (C) Summarize communication link actuation of the whole migration communication system constituted by the mobile station and base station which have the above configuration according to a phenomenon, and explain it to the transmitted power control action last in an operation gestalt. In addition, between a mobile station and a base station, the communication link which went via the wireless propagation path shall already be started.
[0061] (C-1) When the value of the rake SIR received actually becomes large relatively in a base station as compared with Target SIR (contained not only when Rake SIR becomes large still in this case, but when Target SIR is because it falls relatively.)
Since the communication link between a base station and a mobile station turns into a communication link through a wireless propagation path, a receive state tends to be influenced of phasing etc. Then, in the transmitted power control section 125 by the side of a base station, when the condition on this wireless propagation path is supervised using the 1st data sequence (since the propagation path is the same also about the 2nd data sequence), a receive state becomes good like [in this case] and it becomes larger than desired value, a TPC bit is set as "1" in order to order lowering of transmitted power. Then, as control data, it gets down, and multiplex [of the TPC bit] is carried out to link data (message data), and it is notified to the TPC gain count section 109 by the side of a mobile station.
[0062] If it checks that this TPC bit is "1", the TPC gain count section 109 by the side of a base station will be set up so that the closed loop gain about each of the 1st data sequence and the 2nd data sequence may be reduced by 1.0 [dB] every. Unless the TPC gain given to the adjustable gain transmitting amplifier 103 and 106 has modification in other gain elements in this way, it is directed as lowering of 1.0 [dB] and the transmitted power of the 1st and 2nd data sequence in it or subsequent ones declines.
[0063] (C-2) When the value of the rake SIR received actually becomes small relatively in a base station

as compared with Target SIR (contained not only when Rake SIR becomes small still in this case, but when it is because Target SIR becomes large relatively.)
On the other hand, the transmitted power control section 125 by the side of a base station sets a TPC bit as "0" in this case. Similarly this TPC bit is notified to the TPC gain count section 109 by the side of a mobile station through a radio transmission way. However, in this case, since a TPC bit is "0", the TPC gain count section 109 carries out the increment of the TPC gain of the adjustable gain transmitting amplifier 103 and 106 in 1.0 [dB], when it operates so that the increment of the closed loop gain in 1.0 [dB] may be carried out, and there is no modification in other gain elements. Thereby, the transmitted power of the 1st and 2nd data sequence in it or subsequent ones is increased.
[0064] (C-3) the relativity calculated by the quality controller 131 -- if transmitted power used for transmission of each data sequence is made the same when carrying out multiplex [of two or more data sequences from which demand quality differs when SNR is zero or more] and transmitting them on the same frequency (propagation path) -- transmission of one data sequence -- enough -- also coming out -- a condition inadequate for transmission of the data sequence of another side may arise.
[0065] in the base station in this operation gestalt, it asks about the 1st data sequence -- it asks about SNR and the 2nd data sequence the 1st relativity -- SNR and difference are supervised by the quality controller 124 the 2nd relativity, and an MDF bit is controlled so that the receive state of both the data sequence becomes relative almost the same.
[0066] and this case -- like -- relativity -- an MDF bit is set as "1" so that the quality controller 124 by the side of a base station may order lowering of the transmitted power of the data sequence of ** a 1st, since it means that the difference of the observation SNR of as opposed to [when SNR becomes zero or more and SNR becomes larger than SNR the 2nd relativity the 1st relativity, the receive state of the data sequence of ** a 1st becomes good relatively, and] Demand SNR has become quite large. Then, as control data, it gets down, and multiplex [of the MDF bit] is carried out to link data (message data), and it is notified to the TPC gain count section 109 by the side of a mobile station.
[0067] If it checks that this MDF bit is "1", the TPC gain count section 109 by the side of a base station will be set up so that the closed loop gain about the 1st data sequence may be reduced by 0.1 [dB] every. Unless the TPC gain given to the adjustable gain transmitting amplifier 103 has modification in other gain elements in this way, it is directed as lowering of 0.1 [dB] and the transmitted power of the 1st data in it or subsequent ones declines relatively to the transmitted power of the 2nd data.
[0068] (C-4) the relativity calculated by the quality controller 131 -- when SNR becomes smaller than 0, it is the case where SNR becomes larger than SNR the 2nd relativity about the 2nd data sequence the 1st relativity about the 1st data sequence, in this case irrespective of the difference in the quality and the receive state which are required of each data sequence.
[0069] On the other hand, the quality controller 124 by the side of a base station sets an MDF bit as "0" in this case. Similarly this MDF bit is notified to the TPC gain count section 109 by the side of a mobile station through a radio transmission way. However, in this case, since an MDF bit is "0", the quality controller 124 carries out the increment of the TPC gain of the adjustable gain transmitting amplifier 103 in 0.1 [dB], when it operates so that the increment of the closed loop gain in 0.1 [dB] may be carried out, and there is no modification in other gain elements. Thereby, the transmitted power of the 1st data in it or subsequent ones is increased.
[0070] (D) In the migration communication system concerning the effectiveness of an operation gestalt, thus this operation gestalt Also when the communication link quality required of each of the 1st data sequence by which multiplex transmission is carried out on the same frequency, and the 2nd data sequence differs, so that the difference of the observation SNR about each data sequence and Demand SNR may become small By having considered as the configuration which controls the transmitted power of the 1st data sequence, the efficient migration communication system which satisfies the communication link quality as which both the data sequence is required, and does not transmit transmitted power with each superfluous data sequence is realizable.
[0071] Thereby, lowering of the transmission speed by degradation and resending control of communication link quality can be avoided effectively. Moreover, the interference to other users etc. can

be reduced and reduction of the number of cocurrent connection can be avoided effectively.
[0072] (E) other operation gestalten (E-1) -- the relativity for which it asked about each of the 1st data sequence and the 2nd data sequence in the still more nearly above-mentioned operation gestalt -- the difference of SNR and relative SNR(s), i.e., relative SNR,, although the case where an MDF bit was set up was described based on difference the difference of Demand FER and Observation FER for which it asked about the difference of Demand FER and Observation FER for which replaced with this and it asked about the 1st data sequence, and the 2nd data sequence -- you may make it set up an MDF bit so that the difference of comrades may become small
[0073] (E-2) Moreover, although the case where presumed the value of SNR required as SNR observed based on the value of FER required as observed FER in an above-mentioned operation gestalt, and an MDF bit was set to it using the presumed value was described When SNR can be directly calculated about the 1st data sequence and each 2nd data sequence, you may make it set up a direct MDF bit from those values.
[0074] Similarly, when the value of Demand FER and Observation FER can be calculated directly also in the case of the above-mentioned term (E-1), a direct MDF bit is set up from those values, and when not obtained directly, drawing 3 presumes Demand FER and Observation FER reversely from the relation between Demand SNR and Observation SNR, and should just set an MDF bit as it from those estimate.
[0075] (E-3) Moreover, in an above-mentioned operation gestalt, although the case where the controlled system of MDF data was made into the transmitted power of the 1st data sequence was described, also when making the 2nd data sequence into a controlled system, it can apply. In addition, it is good also as a configuration which does not control one of transmitted power but controls the transmitted power of both data sequences according to an individual simultaneously.
[0076] (E-4) Moreover, in an above-mentioned operation gestalt, although the case where two data sequences were multiplexed was described, also when multiplexing three or more data sequences, it can apply. In this case, you may make it control that transmitted power for each [differ in communication link quality] data sequence of every.
[0077] (E-5) Moreover, although the case where the transmitted power of an uphill link was controlled was described, it gets down and you may make it control the transmitted power of a link in an above-mentioned operation gestalt.
[0078] (E-6) Moreover, in an above-mentioned operation gestalt, although the communication system which consists of a mobile station and a base station was explained, don't restrict the relation of the sending station and receiving station which constitute the communication system concerned to this.
[0079] (E-7) Moreover, in an above-mentioned operation gestalt, although the case where each of the TPC bit which directs the change in transmitted power, and an MDF bit was included into the control data to which it is transmitted at a mobile station side was described, it is good also as a configuration which is superimposed and is made to transmit to the commo data itself (namely, the message data itself).
[0080] (E-8) moreover, an above-mentioned operation gestalt -- setting -- a TPC bit -- "1" and "0" -- gain -- 1.0 [dB] -- although it was made to decrease or increase and the MDF bit considered gain as 0.1 [dB] reduction or the configuration to which it is made to increase by "1" and "0", don't restrict to this about the relation between each span of adjustable range and a relative span of adjustable range.
[0081] (E-9) Moreover, in an above-mentioned operation gestalt, although the case where the data of the relation shown in drawing 3 were held as a table means was described, these relation may be held as a transformation and you may decide to ask by the operation each time.
[0082] (E-10) moreover, an above-mentioned operation gestalt -- setting -- relativity -- SNR -- although difference be defined as what lengthened SNR the 2nd relativity from SNR the 1st relativity and the value of an MDF bit be set up by the positive/negative of the value, as long as the setting out approach of an MDF bit be controllable so that the difference of the demand quality search for not only about this but about each data sequence and actual receiving quality approach mutually, it may use other approaches.

[0083] (E-11) Moreover, in an above-mentioned operation gestalt, although the case where this invention was applied to migration communication system was described, if it is the communication system which multiplexes two or more logical data which differ in demand quality through two or more physical channels, also when it is not restricted to migration communication system and uses [for example,] it for the communication link between fixed stations, it can apply.
[0084] (E-12) Moreover, in an above-mentioned operation gestalt, although the case where this invention was applied to code-division-multiple-access (CDMA) communication system was described, if it is the communication system which multiplexes two or more logical data which differ in demand quality through two or more physical channels, multiplex system will not be restricted to a sign division method.
[0085]
[Effect of the Invention] As mentioned above, the 1st communication device which multiplexes the 1st and 2nd logical data which differ in demand quality through two or more physically different communication channels according to this invention, It is based on the receiving quality searched for from the demand quality required of each logical data, and the logical data received actually. To the 2nd communication device in the multiplex communication system which has the 2nd communication device which controls the transmitted power of the 1st communication device which is the transmitting side of the logical data concerned By setting up the transmitted power control information which controls the transmitted power of either of the 1st and 2nd logical data, or both sides according to an individual, and having had the transmitted power control means which transmits this to a 1st communication device side Since the transmitted power is controllable by each logical data unit, a multiplex communication system compatible in the quality required of each logical data and control of superfluous transmitted power is realizable.

[Translation done.]

* NOTICES *

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TECHNICAL FIELD

[Field of the Invention] This invention is applied to the migration communication system (personal communication system (PCS), digital cellular system, etc.) which applies a sign division method as multiplex system, concerning a multiplex communication system, and is suitable.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The following reference is mentioned as reference about the conventional technique.
[0003] Reference 1: "Mobile Station - Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System"IS-95. reference 2:" CDMA-Principles of Spread Spectrum Communication", Andrew J.Viterbi, and Addison Wesley and 1995. reference 3:NTT DoCoMo technical -- the transmitting approach of two or more data systems which can be set to a CDMA communication mode is shown in - journal Vol.4 No.3 [1], for example, reference. A means to thin out the power control data to each mobile station in time sharing on a message channel, and to transmit, and to assign connection control data into the frame of voice data, and to transmit is described by the equipment shown in reference 1. In addition, this means divides a 168 bits [per frame] data area into voice data and connection control data, and is transmitted.
[0004] The distribution approach is defined from a viewpoint of the transmission rate of voice data, and is divided into five kinds on the basis of 9600 bits per second the above of transmission of only voice data, transmission which sets voice data to one half of all data, transmission set to 1/4, transmission set to 1/8, and transmission of only connection control data. Therefore, the number of voice data bits per frame and the number of connection control data bits are set to 168/0, 80/88, 40/128, 16/152, and 0/168. Using the above frame format, according to the amount of information of voice data, the connection control data was adjusted and it has transmitted.
[0005] Moreover, transmitted power control is shown in reference 2. It is shown by the equipment shown in reference 2 that open-loop power control is constituted based on an automatic gain control circuit (the following, AGC circuit). Moreover, power control of a closed loop adjusting power to directions of the power control transmitted from a communication link place, and transmitting it is shown. Especially in reference, it is expressed in order to control an uphill circuit, and corresponding to "0"/"1" of the power control bit transmitted from a base station, carrying out "raising"/"lowering" of the transmitted power is shown.
[0006] Therefore, in the CDMA communication device indicated by the above-mentioned reference 1 and 2, each of voice data and connection control data is logically mapped on the same physics frame, and transmitted power control of open-loop and a closed loop is performed to one physical frame.
[0007] therefore, transmitted power had to be controlled in order to secure the data quality as which severer quality is required, when the quality of the connection control data as the voice data and the 2nd data as the 1st data which is alike, respectively and is demanded differs.
[0008] Moreover, in the case of the above-mentioned reference 1, instead of connection control data, it has specified transmitting the 1st voice data and the 2nd different voice data as the 2nd data, but it is [that transmission of about 10 [kbps] extent same as a transmission rate is only secured, and].
[0009] Moreover, the technique for transmitting a data sequence to a high speed more, i.e., the technique using an orthogonal code sequence, is shown in reference 3. In addition, the method which transmits a high-speed-data sequence using two or more physical channels divided by the orthogonal code sequence is shown in this reference 3, and since two or more physical channels constituted by the orthogonal code

sequence should just transmit the data of the same quality, transmitted power control is carried out only by one line.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, the 1st communication device which multiplexes the 1st and 2nd logical data which differ in demand quality through two or more physically different communication channels in this invention, It is based on the receiving quality searched for from the demand quality required of each logical data, and the logical data received actually. To the 2nd communication device in the multiplex communication system which has the 2nd communication device which controls the transmitted power of the 1st communication device which is the transmitting side of the logical data concerned The transmitted power control information which controls the transmitted power of either of the 1st and 2nd logical data or both sides according to an individual is set up, and it had the transmitted power control means which transmits this to a 1st communication device side. Therefore, since the transmitted power is controllable by each logical data unit, a multiplex communication system compatible in the quality required of each logical data and control of superfluous transmitted power is realizable.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in order to divide into different physical data two or more logical data with which demand quality differs, to fulfill each demand quality and to realize efficient transmission which does not have the delivery in superfluous transmitted power, the means of new transmitted power control according to it is needed.
[0011] A noise is superimposed at the times, such as call data which do not use resending control, the problem of being unable to judge the content of a call in a receiving side arises, at the times, such as connection control data using resending control, it is actually the case where demand quality is not secured, and there is [the overhead by resending becomes superfluous and] a problem which lowering produces in transmission speed.
[0012] Moreover, if superfluous transmitted power is permitted, in a CDMA communication link, it will become the interference to other users' etc. communication link, and will become the cause of the number of cocurrent connection per base station decreasing. The above-mentioned interference occupies most noises for signal transmission, such as other users.

[Translation done.]

JAPANESE [JP,11-313028,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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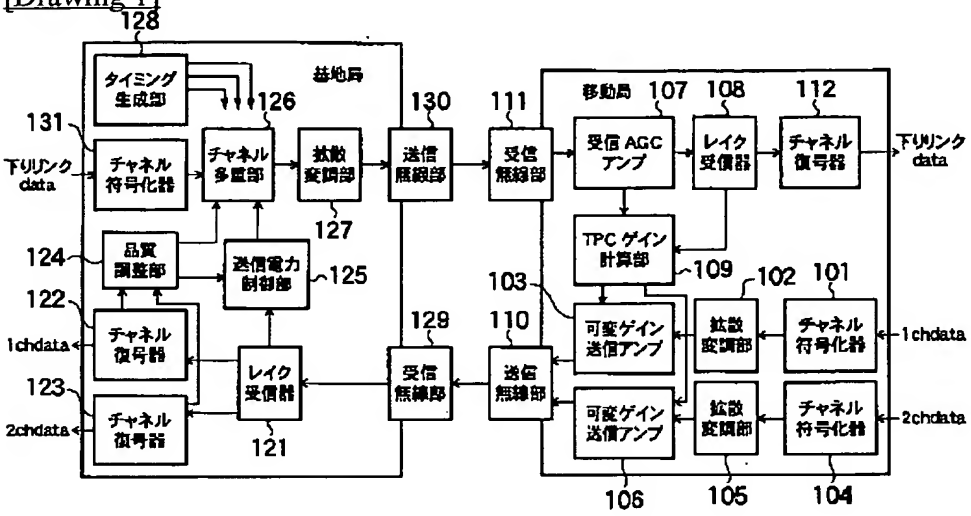
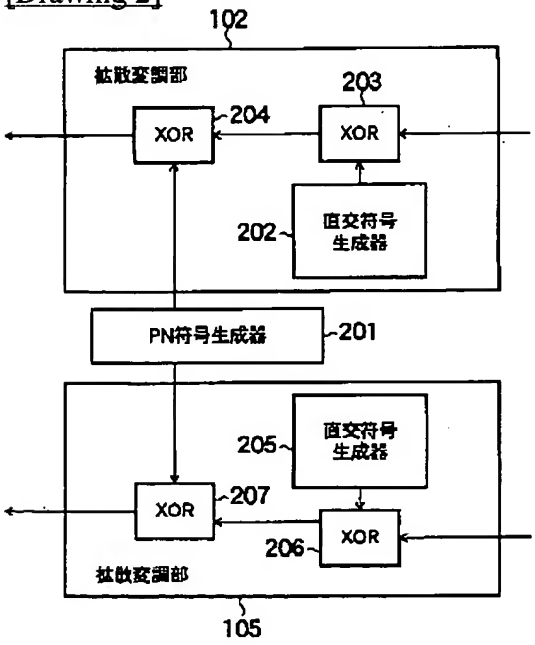
DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]

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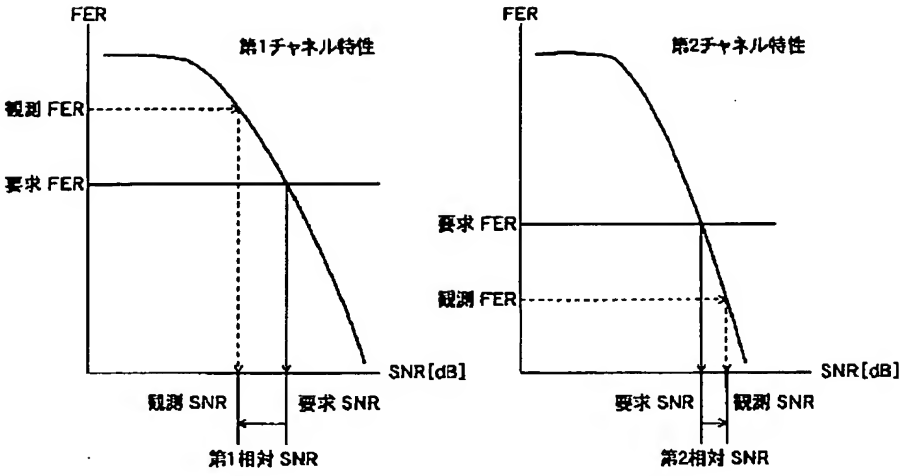
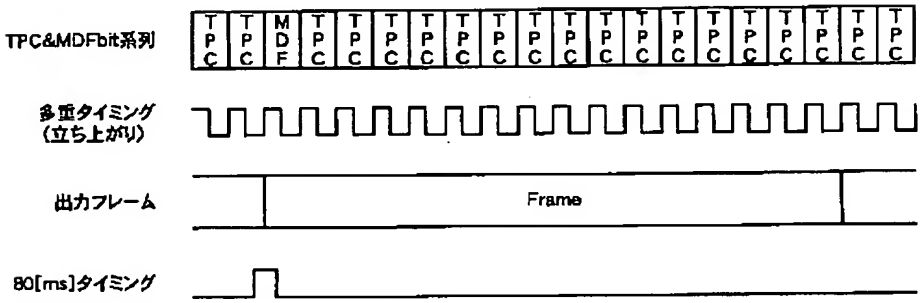


[Drawing 4]



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